Claims

1. A multilayer composite for combustion chambers or nozzles of missiles, comprising an interior layer in contact with the combustion gases and an outer layer, wherein the interior layer is a fiber-reinforced ceramic whose matrix comprises phases of carbon and/or phases of silicon carbide and the outer layer is a polymer reinforced with carbon fibers.

2. The composite as claimed in claim 1, wherein the matrix of the interior layer comprises phases of silicon carbide and phases of carbon and/or phases of silicon.

3. The composite as claimed in claim 1, wherein the matrix of the interior layer has a content of silicon carbide and/or silicon which decreases from the inside towards the outer surface.

4. The composite as claimed in claim 1, wherein the mass fraction of free or chemically bound silicon in the matrix of the interior layer in the inside which is in contact with the combustion gases is at least 50 %.

5. The composite as claimed in claim 1, wherein the mass fraction of free or chemically bound silicon in the matrix of the interior layer in the outside which faces away from the combustion gases is not more than 30 %.

6. The composite as claimed in claim 1, wherein the mass fraction of carbon in the outside of the interior layer which faces away from the combustion gases is at least 95 %.

7. The composite as claimed in claim 1, wherein the reinforcing fibers of the interior layer have a mean length of at least 50 mm.

8. The composite as claimed in claim 1, wherein the reinforcing fibers of the outer layer have a mean length of at least 50 mm.

9. The composite as claimed in claim 1, wherein the volume fraction of fibers in the outer layer is at least 35 %.

10. The composite as claimed in claim 1, wherein the polymer of the outer layer comprises carbonizable polymers and the mass of the pyrolysis residue of these polymers is at least 35 % of the mass of the polymers.

11. The composite as claimed in claim 1, wherein the mean thickness of the outer layer is less than the mean thickness of the interior layer.

12. A process for producing combustion chambers or nozzles for missiles, comprising an interior layer in contact with the combustion gases and an outer layer, which process comprises

1. producing an intermediate body which is reinforced with carbon fibers and has a matrix comprising carbon and has the shape of the interior layer,
2. silicizing at least the inside of the intermediate body by means of a silicon melt,
3. covering the outside of the silicized intermediate body with a polymer-impregnated woven fabric, polymer-impregnated fiber bundles or polymer-impregnated fiber layups, with the material of the fibers and woven fabrics being carbon and the polymer being thermally curable, wherein the fibers

are long fibers with a mean length of at least 50 mm, and

4. curing the outer layer formed by the covering to form a polymer reinforced with carbon fibers.

13. The process as claimed in claim 12, wherein the silicon melt for the silicization of the intermediate body is introduced essentially from the inside of the intermediate body.

14. The process as claimed in claim 13, wherein the silicon melt is added in a deficiency, so that the silicon content in the silicized intermediate body decreases from the inside towards the outside.

15. The process as claimed in claim 14, wherein the silicon melt is supplied only in such an amount that the mass fraction of free or chemically bound silicon on the outside of the intermediate body facing away from the combustion gases is not more than 30 %.

16. The process as claimed in claim 12, wherein the fiber reinforcement of the C/C body is made up of a plurality of layers of woven carbon fiber fabric and/or carbon fiber rovings.

17. The process as claimed in claim 12, wherein the long fiber reinforcement of the outer layer is made up of a plurality of layers of woven carbon fiber fabric and/or carbon fiber rovings.

18. The process as claimed in claim 12, wherein the polymers of the outer layer are selected from among phenolic resins, polyesters, epoxy resins, polyurethanes and organosilicon polymers.

19. A method of use of composites as claimed in claim 1 comprising forming the composites into combustion chambers or nozzles of rockets.